

## Marine Life Protection Act Initiative



### Size and Spacing Evaluations of the Round 1 External Proposed MPA Arrays for the MLPA North Coast Study Region

Presentation to the MLPA Blue Ribbon Task Force  
May 3, 2010 • Crescent City, CA

Dr. Mark Carr, Co-chair • MLPA Master Plan Science Advisory Team

## Round 1 Evaluation Notes, Part 1



- Most external marine protected area (MPA) arrays proposed tribal uses in some MPAs, including otherwise “no-take” areas, but did not specify types of uses (i.e., gear, species)
- MLPA Master Plan Science Advisory Team (SAT) **did not have sufficient information in Round 1 to integrate tribal uses in evaluations** (i.e. proposed tribal uses were not considered in assigning levels of protection), **but this will likely change in Round 2**



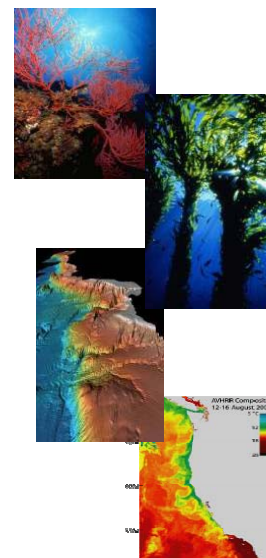
## Round 1 Evaluation Notes, Part 2

- For the sake of consistency, **state marine conservations areas (SMCAs) in External MPA Array C** that proposed tribal uses only were **evaluated as state marine reserves (SMRs)**
- For evaluations, **mobile MPAs in External MPA Array A were treated as static**, and stewardship zones were not evaluated
- Recent additions and revisions to substrate data slightly changed the evaluation results; **this presentation includes revised results**



## MLPA Goals\*: Populations

1. To protect the natural diversity and function of **marine ecosystems**.
2. To help sustain and restore **marine life populations**.
3. To improve **recreational, educational, and study opportunities** in areas with minimal human disturbance.
4. To protect representative and unique **marine life habitats**.
5. Clear objectives, effective management, adequate enforcement, sound science.
6. To ensure that MPAs are designed and managed as **a network**.



*\* Note that this language represents a summary of the MLPA goals*



## Protecting Populations (Goals 2 & 6)

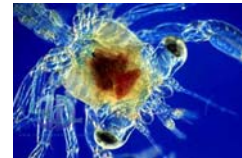
### Size and Spacing



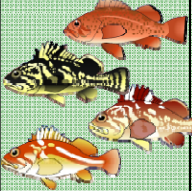

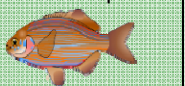
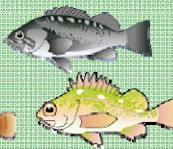

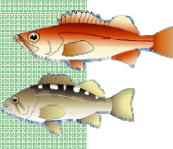





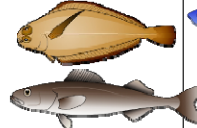



MPAs should be large enough that adults do not move out of them too frequently and become vulnerable to fishing



MPAs should be close enough together that sufficient larvae can move from one to the next



## Reserve Size and Species Protected

0 – 1 km	1 – 10 km	10 – 100 km	100 – 1000 km	> 1000 km
<p>Many rockfish</p>  <p>Other reef fish</p>  <p>Some surfperch</p> 	<p>Some rockfish</p>  <p>Some surfperch</p> 	<p>Some rockfish</p>  <p>Other reef fish</p>  <p>Some flatfish</p> 	<p>Few rockfish</p>  <p>Some schooling fish</p>  <p>Salmon</p>  <p>More flatfish</p> 	<p>Some schooling fish</p>  <p>Tunas</p>  <p>Many sharks</p> 



## Size Guidelines



**MPAs should have an alongshore span of 5-10 kilometers (3-6 miles) of coastline, and preferably 10-20 kilometers (6-12.5 miles)** to protect adult populations, based on adult neighborhood sizes and movement patterns. Larger MPAs should be required to fully protect marine birds, mammals, and migratory fish.



**MPAs should extend from the intertidal zone to deep waters offshore** to protect the diversity of species that live at different depths and to accommodate the ontogenetic movement of individuals to and from nursery or spawning grounds to adult habitats.



Combined and simplified, these two guidelines yield:  
**Minimum range of 9-18 square miles**  
**Preferred range of 18-36 square miles**



## Size Analysis Methods



Measure individual MPA areas



Consider level of protection



Combine contiguous MPAs into MPA "clusters"

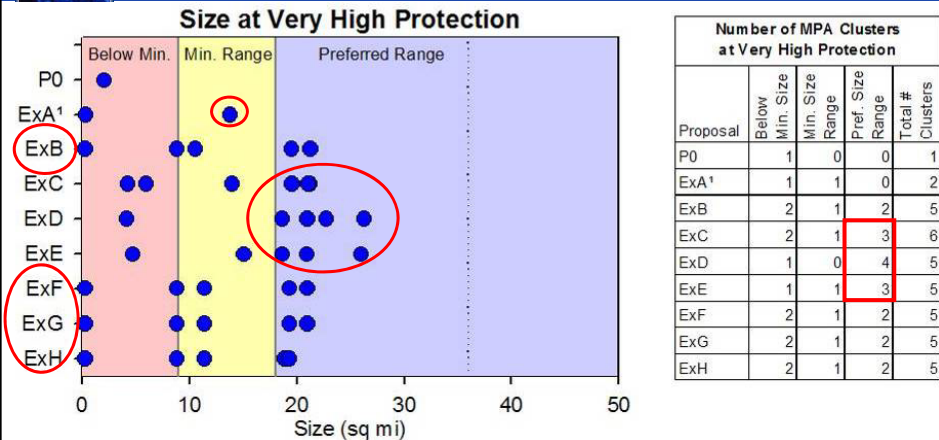


Tabulate MPA cluster areas relative to minimum and preferred guidelines



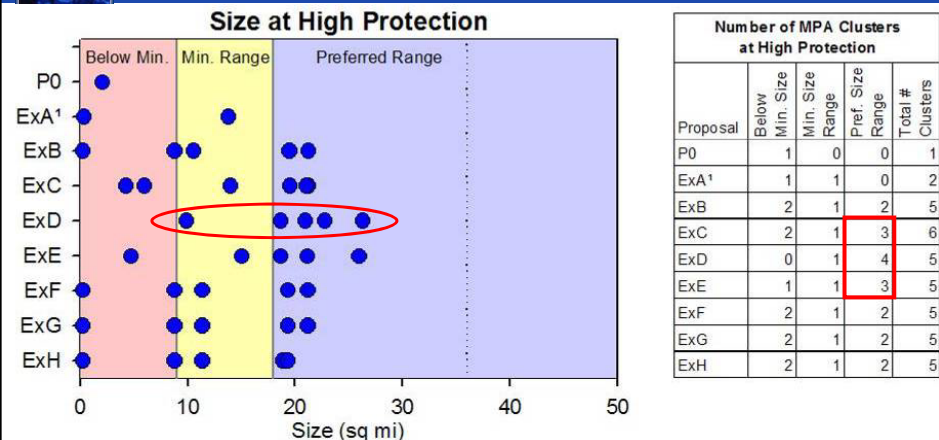
Estuarine MPAs are not included in size evaluation

## Cluster Sizes: Very High Protection



- ExD includes the most preferred size clusters (4), followed by ExC and ExE with 3
- ExB, ExF, ExG and ExH have similar configurations
- ExA includes 1 minimum size cluster and no preferred size clusters

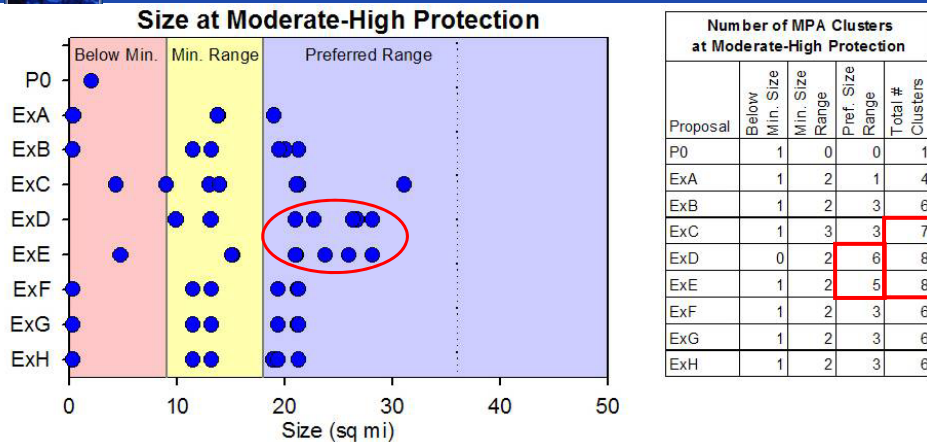
## Cluster Sizes: High Protection\*



- All open coast clusters in ExD meet the size guidelines
- ExC, ExD and ExE include the most preferred size clusters

\* Evaluated for all open coast MPAs at or above high protection

## Cluster Sizes: Mod-high Protection\*



- Across all proposals, most clusters meet size guidelines
- ExD and ExE include the most preferred size clusters
- ExC, ExD and ExE include largest number of clusters and most that meet size guidelines

\* Evaluated for all open coast MPAs at or above moderate-high protection

## Size: Conclusions

- ExD has the largest number of MPA clusters that meet preferred size guidelines, followed closely by ExE
- ExB, ExF, ExG and ExH have similar configurations
- ExA has the fewest MPA clusters that meet minimum or preferred size guidelines at high and mod-high protection
- Ranking of arrays for median cluster size at moderate-high protection:  

$$\text{ExD} > \text{ExE} > \text{ExC} > [\text{ExB}, \text{ExF}, \text{ExG} \ \& \ \text{ExH}] > \text{ExA}$$
- All arrays have some MPAs that do not meet minimum size guidelines at very high protection





## Protecting Populations

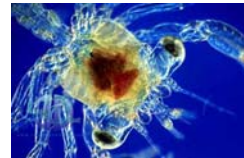
### Size and Spacing



MPAs should be large enough that adults do not move out of them too frequently and become vulnerable to fishing



MPAs should be close enough together that sufficient larvae can move from one to the next



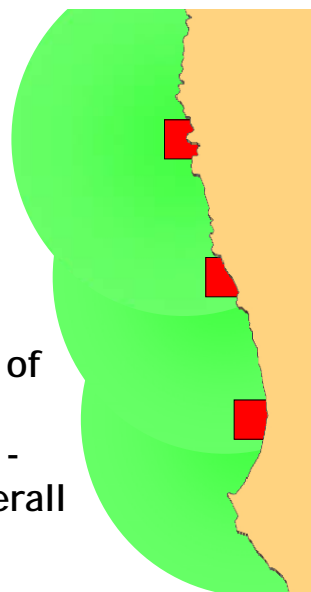
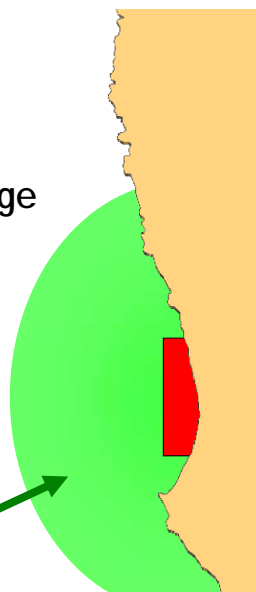
## Characteristics of Networks

Single large reserve

dispersal of young



Network of smaller reserves - same overall size





## Design Guidelines: Goals 2 and 6



**MPAs should be placed within 50-100 kilometers (31-62 miles) of each other** to facilitate dispersal and connectedness of important bottom-dwelling fish and invertebrate groups among MPAs



Because many populations are habitat-specific, spacing is evaluated for each habitat



## Spacing Analysis Methods



MPAs or clusters must meet minimum size guidelines (9 square miles) to be included in spacing analysis



Identify the habitats included in sufficient amounts to count as a “replicate” within each MPA cluster



Measure gaps between adjacent MPA clusters that contain a given habitat (edge to edge)

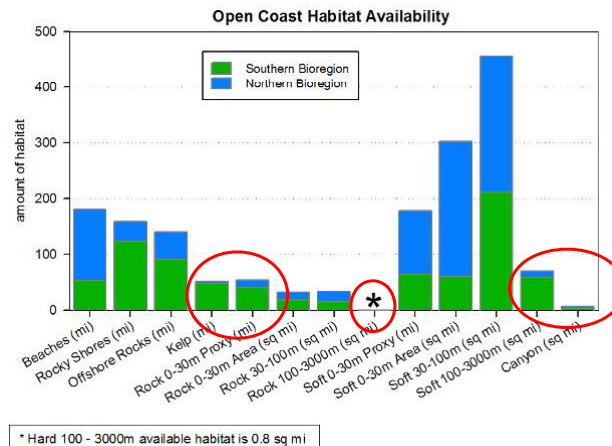




## Habitat Availability and Spacing

### Habitat availability and distribution limits spacing:

- Kelp and 0-30 meter (m) rock rare in the northern bioregion
- >100m depth habitats are relatively rare across the region, occurring mostly in canyons and the southern bioregion

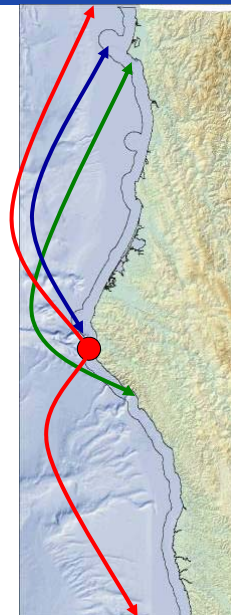


*Note: some substrate mapping and 0-30m proxy line were not available when external MPA arrays were designed*

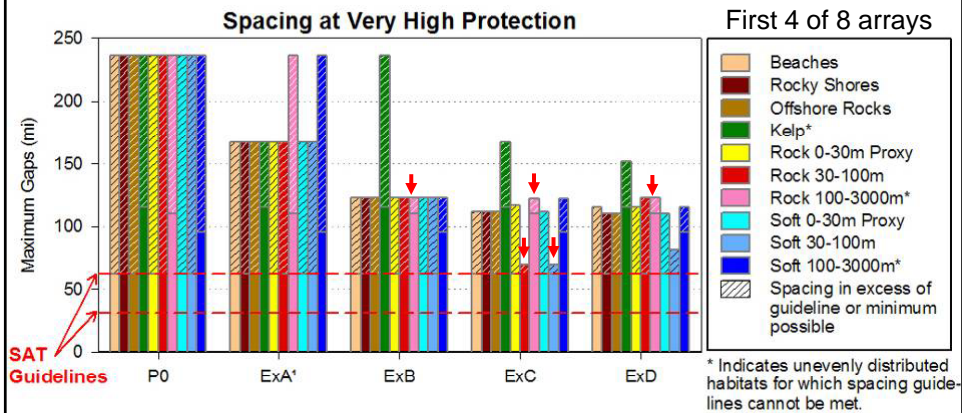


## Spacing: Unevenly Distributed Habitats

- For some unevenly distributed habitats, spacing guidelines are impossible to meet
- Minimum possible spacing for these habitats:
  - Kelp:** 115 miles (mi)
  - Deep soft bottom** (100-3000m): **95 mi**
  - Deep rock** (100-3000m): **110 mi**  
only available in one area in the north coast study region

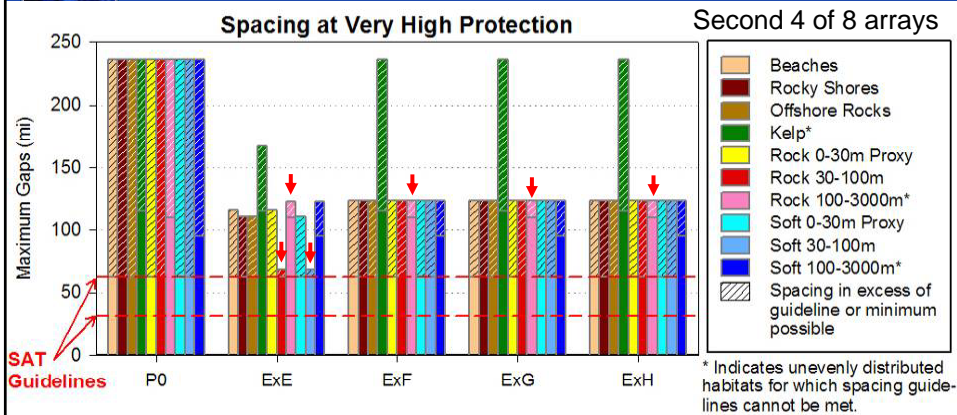


## Max Gaps: Very High Protection



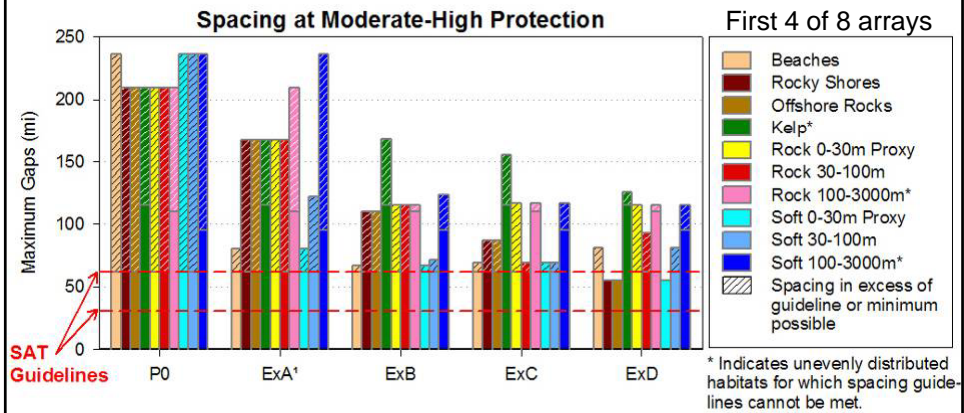
- Not possible to meet spacing guidelines for kelp, rock 100-3000m, or soft bottom 100-3000m
- ExB, ExC and ExD approach minimum possible spacing for deep rock (100-3000m)
- ExC approaches spacing guideline for 30-100m rock and soft bottom

## Max Gaps: Very High Protection



- Not possible to meet spacing guidelines for kelp, rock 100-3000m, or soft bottom 100-3000m
- ExE, ExF, ExG and ExH approach minimum possible spacing for deep rock (100-3000m)
- ExE approaches spacing guideline for 30-100m rock and soft bottom

## Max Gaps: Mod-high Protection\*



**Number of habitats for which spacing is less than 10 miles over the maximum guideline (or minimum possible spacing):**

ExA = 0

ExB = 4

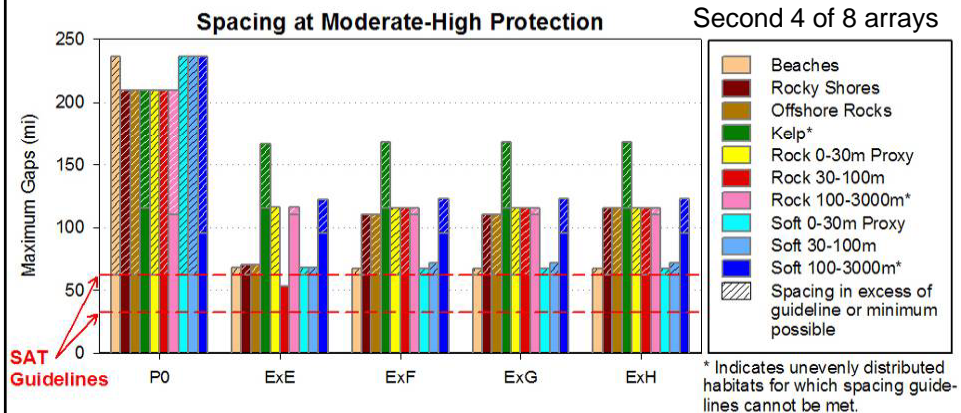
ExC = 5

ExD = 4

**ExD falls within** spacing guidelines for 3 habitats

\* Evaluated for all open coast MPAs at or above moderate-high protection

## Max Gaps: Mod-high Protection



**Number of habitats for which spacing is less than 10 miles over the maximum guideline (or minimum possible spacing):**

ExE = 7

ExF = 4

ExG = 4





ExH = 4

**ExE falls within** spacing guidelines for 1 habitat

\* Evaluated for all open coast MPAs at or above moderate-high protection



## Spacing: Conclusions

-  ExD achieves spacing guidelines for 3 habitats and, on average, exceeds guidelines or minimum possible spacing by the lowest margin, followed closely by ExE
-  ExE has fewest “large” gaps (>10 miles over the guideline or minimum possible)
-  All arrays have substantial gaps in 0-30m rock as measured by proxy line, possibly because this information was not available when arrays were developed
-  Ranking of arrays based on average gap in excess of the guideline or minimum possible spacing:  

$$\text{ExD} < \text{ExE} < \text{ExC} < [\text{ExB}, \text{ExF} \ \& \ \text{ExG}] < \text{ExH} < \text{ExA}$$



## Corrections to Round 1 Evaluations

### Spacing for some habitats increased

- In ExD the replicate of 30-100m rock lost in Pt. Cabrillo cluster increases spacing for that habitat by 25 miles

### Spacing for some habitats reduced

- In ExE the replicate of 30-100m rock gained in False Cape SMCA reduces spacing for that habitat by 15 mi
- In ExA the replicate of 0-30m soft bottom gained in Eureka Mobile SMCA reduces spacing for that habitat by 42 mi
- In ExB, ExF, ExG and ExH the replicate of 0-30m soft bottom gained in Eel River SMCA reduces spacing for that habitat by 5 mi
- In ExE, the replicates of 0-30m soft bottom and 30-100m soft bottom gained in False Cape SMCA reduces spacing for those habitats by 1 mi